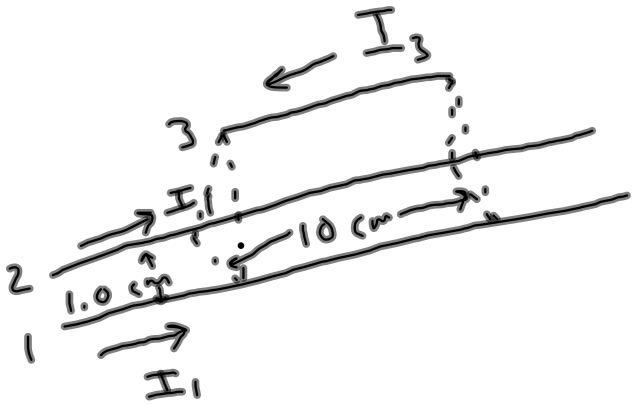
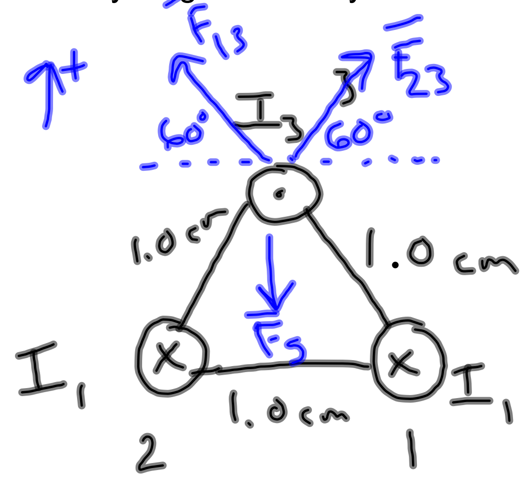
Magnetism Notes and Practice Problem 12.6.11 AP Physics

Two infinitely long, parallel wires are lying on the ground 1.00 cm apart. A third wire, of length 10.0 m and a mass of 400 g, carries a current of 100 A and is levitated above the first two wires, at a horizontal position midway between them. The infinitely long wires carry equal currents in the same direction, but in the direction opposite to that in the levitated wire. What current must the infinitely long wires carry so that the three wires form an equilateral triangle?





$$\Sigma F_y = 0 \qquad F_{13} = \frac{\mu_0 I_1 I_3 l}{2\pi r}$$

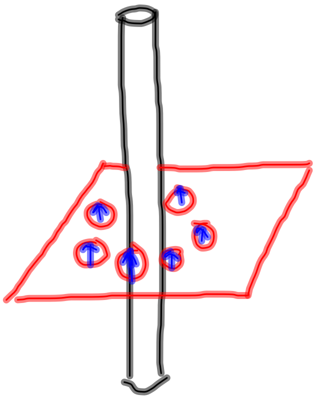
$$F_{13}\sin(60°) + F_{23}\sin(60°) - m_3 g = 0$$

$$(2)\frac{\mu_0 I_1 I_3 l}{2\pi r}\sin(60°) = m_3 g$$

$$I_1 = \frac{2\pi r m_3 g}{2\mu_0 I_3 l \sin(60°)}$$

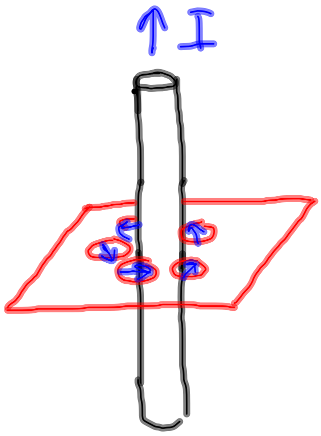
$$= 113\text{ A}$$

Ampère's Law:



Current off

Magnets point towards magnetic north



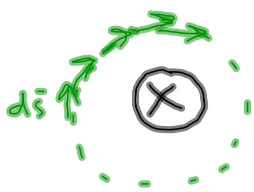
Current on

$\bar{B}$ is ccw

$$\oint \bar{B} \cdot d\bar{s} = \mu_0 I$$

For a circle, this becomes

$$B = \frac{\mu_0 I}{2\pi r}$$



↳ from the center of the wire

• Magnetic Field for a Solenoid:

- See figures 30.16 and 30.18

- $$B = \frac{\mu_0 N I}{l} = \mu_0 n I$$

$n = \frac{N}{l}$

N = # of turns

l = length of the solenoid

• Magnetic flux:

- How much magnetic field goes through a defined area

$$= \int \bar{B} \cdot d\bar{A}$$

$$\Phi = BA\cos\theta$$

ϕ_m

↳ Greek capital phi

Magnetic Flux